$$E_R(\mathrm{I})=\frac{G}{16}\eta_0 q^2\left\{\sin^2\phi+\frac{1}{n^2}\cos^2\phi)\left(\frac{l}{d}\right)^2\right\}$$

$$E_R(\mathrm{II})=\frac{G}{16}\eta_0 q^2\left\{\sin^2\phi\left(\frac{l}{d}\right)^2\right\}$$

$$E_R(\mathrm{III})=\frac{G}{16}\eta_0 q^2\left\{\frac{1}{n^2}\cos^2\phi\left(\frac{l}{d}\right)^2\right\}.$$

G: total volume of macromolecule　　n: number of elements

ϕ: angle between two elements　　l: total length of a molecule

Using above relations, the following equation can be obtained for the viscosity of a rod-like macromolecule in solution.

$$\eta=\eta_0\left\{1+2.5G+\frac{G}{24}\left\{\sin^2\phi+\frac{1}{n^2}\cos^2\phi\right)\left(\frac{l}{d}\right)^2\right\}.$$

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35. Studies on the Polyvinyl Octyl- and Enant-acetals

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The octyl-, enant- or its mixed acetals with butyral were made from polyvinyl alcohol in water, benzene or dioxane. The experimental results on the solubility of acetals are shown in Table I.

Table I. Solubility of acetals, acetalized in water phase.
(Polyvinyl alcohol 5 g., 17.5% HCl 50 cc., equivalent ratio of aldehyde used, 1 : 1, Temp. 30°C., Time 30 min.,) S: Soluble; I: Insoluble.

Kinds of aldehydes	Degree of acetalization (Mole %)	Solubility against					
		Methanol	Ethanol	Acetone	Butyl-acetate	Cyclo-hexanone	Dioxane
Form-	33.1	I	I	I	I	I	I
Acet-	43.2	S	S	I	S	S	S
Propion-	59.6	S	S	S	I	S	S
Butyr-	62.8	S	S	I	I	S	S
Enant-	63.6	I	I	I	I	S	S
Octyl-	64.0	I	I	I	I	S	S

Enantacetal was also soluble in ethylenechloride, nitrobenzene, mixture of benzene-ethylenechloride (1:1), benzene-carbon tetrachloride (1:1), benzene-ethanol (1:1) in hot state or partially soluble in aniline.

The mechanical properties of films obtained from both acetals were measured

Table II. Mechanical properties of films.

Kinds of acetals	Degree of acetalization (Mole %)	Strength* (Kg/mm^2)	Elongation* (%)	Softning Temp. in water (°C.)
Enant-	64.0	2.72	237.9	64
Octyl-	63.4	0.93	255.2	46

*) Measured at 22°C.

Some properties were found to be almost the same as those obtained from the plasticized butyral.

In the direct acetalization from polyvinylacetate in methanol phase, only small percentages of acetyl groups in the acetate could be replaced by both aldehyde groups.

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36. Some Experiments on the Bubble-type Emulsion Polymerization

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The experimental results on the bubble-type emulsion polymerization of vinylchloride were already reported in the case of one-component catalyst system such as pottasium persulphate (The Chem. of High Polymer, Japan. **6** 436, 1949). We extended these methods of polymerization to the three-components system such as pottasium persulphate, ferrous sulphate and oxalic acid. Also at room temperature, the rate of polymerization was found to be pronouncedly acceralated by light. The results obtained were summarized as follows.

(a) At various concentrations of catalyst, the rate of polymerization was almost constant and the initial one was found to be nearly equal to the rate of blowing-in.

(b) The rate was not changed by the polymerization-temperature, but decreased slowly with the time of polymerization, is due to the screening effect of light by the turbidity of emulsion.

(c) The relations were found to be almost linear between the rate of decomposition of catalyst and the rate of polymerization. The amount of polyvinylchloride polymerized per atom of oxygen produced by decomposition of catalyst was experimentally same as the degree of polymerization of polyvinylchloride measured.